

EVALUATION OF SPRUCE BEETLE, DENDROCTONUS OBESUS MANN.  
Northern Region, 1969

U.S. DEPARTMENT OF AGRICULTURE - FOREST SERVICE  
Division of State and Private Forestry  
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By

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## SUMMARY

Intensive examinations of spruce beetle, Dendroctonus obesus Mann., infestations in Engelmann spruce, Picea engelmanni Parry, were conducted on the Glacier View, Tally Lake, Coram-Hungry Horse, and Swan Ranger Districts, Flathead National Forest; Fortine, Yaak, and Eureka Ranger Districts, Kootenai Forest; and on the Kaniksu and Colville National Forests during fall 1969. Spruce beetle killed several thousand mature and overmature spruce in concentrated groups on the Flathead and Kootenai Forests during 1966. Logging, winter temperatures, woodpeckers, insect parasites and predators reduced the overall beetle population to a low level during 1968-69. Biological factors are expected to reduce the remaining overwintering population even further before beetle flight in 1970. Some tree mortality is expected during 1970. Direct control, other than the possibility of a trap-tree program for protection of existing nearly pure spruce stands immediately adjacent to and surrounding Big and Little Therriault Lakes recreation area, is not anticipated at this time. Removal of infested trees and burning of infested slash, cull logs and stumps is recommended to reduce beetle populations and prevent additional trees from being attacked.

## FLATHEAD NATIONAL FOREST, MONTANA

### INTRODUCTION

Forest workers conducting routine timber surveys detected large groups and scattered single spruce trees infested with spruce beetle during winter 1967-68 on the Glacier View Ranger District. Extensive examinations by entomologists confirmed these findings in practically every drainage containing mixed and pure stands of mature and overmature spruce from Columbia Falls, Montana, north to the Canadian Border. Examinations during August 1968 showed hibernating adult beetles had emerged and attacked standing green spruce.

Infested Engelmann spruce trees were detected in Gregg and Good Creeks, Tally Lake Ranger District; and in the Upper Stillwater drainage on State of Montana lands during winter and spring 1968-69.

Spruce beetle attacked several hundred mature and overmature spruce during 1968 in Dodge, Skyland, and 25-Mile Creeks, Moose Lake, and in the Quintonkin Creek drainage, Coram Ranger District.

Intensive operational surveys were initiated in September 1968 to determine extent and severity of the infestation on the Glacier View Ranger District. About 36,000 acres of spruce type were surveyed. Infested trees per acre varied from 0 to 37 (average 3.3 per acre). About 40 percent of the merchantable spruce was infested in some areas.

Surveys in Good, Alder, and Gregg Creeks, and the Upper Whitefish Lake area showed an increase of insect populations and number of infested trees from 1966 to 1968. Approximately 1,600 acres were surveyed. Number of infested trees per acre varied from 4.5 to 16.6. Over 4 million board feet of infested timber was marked for cutting on the Tally Lake Ranger District during F.Y. 1969.

Biological examinations, conducted in a majority of known spruce beetle infestations during fall 1969, showed a reduction in number of hibernating adult beetles that will fly and infest standing green trees in 1970. Many pure stands of mature and overmature spruce are depleted. Beetles emerging during 1970 will probably infest larger diameter spruce in adjacent mixed type, and uninfested pure spruce type.

Infestations occurred mostly in centers of pure mature and overmature spruce type in lower canyons and along creek bottoms; and appear to be associated with recent logging operations and spruce blowdown.

Heavy beetle flight occurred during July-September 1968. Some beetles flew in 1969 and infested, for the most part, trees that were strip attacked during 1968. Incidence of new attack in blowdown and logging slash was minimum.

Observations during fall 1968 showed a few beetles had reached the teneral adult stage. In 1969, attacked trees contained eggs and small larvae produced by beetles that reemerged, beetles with a 1-year life cycle, or beetles emerging from standing trees, windthrow, snowbreak or slash infested during 1967.

During 1969, brood density counts were taken in 19 areas. Sampling consisted of removing two 6- by 6-inch bark squares at breast height from opposite sides of trees. Gallery starts averaged 10.2 per square foot sample. Attacking adults averaged 20.0 per square foot sample during fall 1968. Number of adult beetles now present is five times less than the number of adults which attacked the same host in 1968. Data are summarized in table 1. Extensive woodpeckering required many samples be taken below breast height. Woodpeckering of some spruce to ground level prevented sampling.

Natural factors, insect parasites and predators, woodpeckers, and cold temperatures reduced overall brood density from an average of about 179.0 to 4.2 per square foot of bark area sampled from 1968 to fall 1969. These biological agents are expected to cause additional reduction of the hibernating adult population before the major beetle flight in 1970.



Although a reduction in spruce beetle populations has occurred, average number of insect parasites and predators per square foot of bark area sampled remained virtually the same (table 1). Predacious flies and beetles comprised the majority of entomophagous insects found in samples. Few insects known to be parasitic on spruce beetle broods were observed. Terrell (1954)<sup>1/</sup> found that parasites and predators are able to survive cold temperature extremes better than their hosts. He also found that as bark beetle mortality increases, so does mortality of predators, but at a slower rate.

Woodpeckers contributed to overall population reduction by direct predation--removing bark, allowing larvae and pupae to drop to the ground--and by initiating drying which promotes brood mortality. Many spruce were denude of bark to ground level. Hutchison (1951)<sup>2/</sup> found that during spruce beetle epidemics, about 99 percent of the winter food of woodpeckers consisted of larvae and adults of spruce beetles. Woodpecker predation continued throughout the summer which hastened drying of boles, resulting in rapid checking and a reduction in lumber grade.

Cold temperatures were probably responsible for reduction of spruce beetle populations. Climatological data shows average maximum temperatures between November 1968 and March 1969 ranged from 0.3° to 12.2° F. colder than the previous 5-year average for the same period of time. Minimum temperatures averaged 2.5° to 13.2° F. colder than the previous 2-year average during the period November through March. Minimum temperatures averaged -32° F. The lowest recorded temperature adjacent to spruce beetle infested areas was -49° F. in December 1969 at Fortine, Montana. Massey and Wygant (1954)<sup>3/</sup> found in laboratory tests that -15° F. will kill nearly all adult beetles.

#### DISCUSSION

The large number of green trees that succumbed to spruce beetle attack in 1968 probably resulted from a population of spruce beetle that built up to epidemic proportions in logging slash, cull logs, windthrow, and snowbreak during the preceding 3 years. Affect of drought in 1967 may have carried over into 1968 and predisposed spruce to attack.

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<sup>1/</sup> Terrell, T. T. Mortality of the Engelmann spruce beetle brood during the winter. Intermountain For. and Range Experiment Station, Research Note 10, 6 pp., 1954.

<sup>2/</sup> Hutchison, F. T. The effects of woodpeckers on the Engelmann spruce beetle, *Dendroctonus engelmanni* Hopk. Masters Thesis, Colorado State University. 73 pp. illus., 1951.

<sup>3/</sup> Massey, C. L. and N. D. Wygant. Biology and control of the Engelmann spruce beetle in Colorado. USDA Circular No. 944, 35 pp., 1954.

Table 1.--Data collected during examination of spruce beetle infested Engelmann spruce on the Glacier View District during August 1968-69

<u>Infested area</u>	<u>Average d.b.h.</u>		<u>Number of samples</u>		<u>Average brood density per square foot</u>		<u>Average parasites and predators per square foot</u>	
	<u>1968</u>	<u>1969</u>	<u>1968</u>	<u>1969</u>	<u>1968</u>	<u>1969</u>	<u>1968</u>	<u>1969</u>
<u>Glacier View District</u>								
Frozen Lake	27.6	15.2	20	14	140.8	7.4	1.4	6.00
Whale Creek	16.0	20.7	20	20	155.6	1.3	--	1.20
Nicola	--	29.2	--	20	--	10.0	--	.70
Moose Creek	22.5	25.6	20	20	152.3	3.8	1.0	.04
Cyclone Lake	2.9	21.1	6	20	171.2	1.1	--	.70
Hay Creek	25.0	27.8	14	20	186.4	3.7	3.0	2.20
Trail to Benchmark	--	27.1	--	16	--	3.7	--	3.50
Red Meadow Creek	24.0	28.2	20	20	200.9	3.2	2.4	1.20
Coal Creek	18.0	26.3	18	22	198.8	7.2	--	2.20
Werner Creek	--	25.3	--	16	--	9.2	--	2.00
Halloway Creek	--	24.2	--	10	--	4.8	--	--
Canyon Creek	25.0	27.6	20	18	228.3	4.8	2.4	.02
Moran Creek	18.4	--	20	--	242.0	--	1.0	--
Whale Creek Akinkoka	15.8	--	20	--	116.8	--	3.0	--
Teepee Creek	--	18.1	--	10	--	3.6	--	6.00
<u>Coram District</u>								
Skyland Creek	--	27.2	--	20	--	.8	--	1.40
25-Mile Creek	--	24.2	--	18	--	3.0	--	4.20
Moose Lake	--	26.2	--	18	--	2.8	--	1.10
<u>Tally Lake District</u>								
Gregg Creek	--	--	--	20	--	1.4	--	--

Based on available data and past experience, additional green trees will probably become infested in July and August 1970; however, less than a 1:1 buildup is expected in all areas examined. Additional tree mortality is expected in areas containing pure and mixed mature and overmature spruce type. Trap trees in conjunction with logging may be necessary to reduce the incidence of tree killing in areas containing large volumes of merchantable spruce.

Green trees, slash, cull logs, and stumps should provide a reservoir of favorable host material for spruce beetle buildup in many drainages, and should attract a majority of beetles which fly during summer 1970. Infested slash should be destroyed before beetles reach maturity and fly to new areas.

#### KOOTENAI NATIONAL FOREST, MONTANA

Approximately 31 percent of mature and overmature spruce have been killed in Wigwam and Bluebird drainages, Fortine Ranger District, since 1966. Infestation has spread through a majority of pure spruce stands. The only other area containing infested volume of spruce is around the Therriault Lakes Campgrounds. A few scattered single trees occur in mixed spruce type in the Graves Creek drainage and some of its side tributaries.

Examination in fall 1968 showed standing green trees had sufficient brood present that could mature and infest new trees and logging slash in 1970.

Extensive logging sales were initiated in 1968-69 to remove infested trees and uninfested mature and overmature spruce in the Wigwam and Bluebird drainages. Many log decks were left during winter 1968-69 to attract beetles emerging during summer 1969. Trap trees were felled to absorb emerging beetles and prevent additional green trees from becoming infested within the Therriault Lakes recreation area.

Evaluations during 1969 show brood densities average about five per square foot of bark area sampled. This is one-half the number of adult beetles which successfully attacked these trees during 1968.

Woodpeckers drastically reduced larval populations during winter 1968-69. Some trees were completely denude of bark to ground level. Heaviest brood mortality occurred in larger diameter trees that were completely debarked the entire infested length before beetles developed to adults and dropped to the base of trees to hibernate.

Cold temperatures are suspected of causing mortality of many beetle populations. Maximum temperatures, between November 1968 and March 1969, averaged 6° to 10° F. cooler than the previous 10 years for the same period of time. Minimum temperatures averaged 8° to 11° F. cooler during 1968-69 winter than the previous two winters for about the same period of time.

Considerable windthrow which occurred in the Therriault Lakes recreation area after beetle flight this past summer, combined with logging slash, should serve to attract hibernating adult beetles which fly during summer 1970. Removal of



infested windthrow, and burning of slash should reduce beetle populations. Woodpeckers, insect parasites and predators are expected to cause additional brood reduction before beetle flight this year. We expect few green trees will be infested during 1970.

In the Pete Creek drainage, about 25 to 50 spruce were infested during 1968. The infestation stemmed from a blowdown of approximately 50 trees 3 to 4 years ago. Only five 1969 attacked trees were found. Brood densities averaged five per square foot of bark area sampled. Insect parasites and predators averaged 1.3 per square foot sample. Mortality through winter, resulting from woodpeckers, entomophagous feeders and ~~cool~~<sup>freezing</sup> temperatures will probably reduce existing broods to a lower level before beetle flight in 1970. Suppressive action is not recommended at this time.

Spruce beetle populations are at low levels elsewhere on the Forest.

#### COLVILLE NATIONAL FOREST, WASHINGTON

Mature and overmature spruce in Deimer-Upper Sullivan Creek drainage were heavily attacked by beetles in 1968 and 1969. There appears to be about a 1:1 ratio of 1-year to 2-year life cycle beetles in this drainage. Many infested green trees examined contained large larvae that may complete development and fly next year.

Woodpecker activity, although evident, was not of the same magnitude as observed on the Flathead Forest. Few parasites were observed.

Scattered 1-year-old slash, following logging operations, contained good populations of larvae and adult beetles.

Hibernating adults, accompanied by beetles that complete development next spring, are expected to cause continued tree losses through next year. A complete slash disposal program, along with removal of infested and susceptible host material would do much to reduce beetle populations in this area. The Forest is currently intensifying their sales programs to include removal of infested and salvage merchantable trees in an effort to reduce beetle problems in Deimer Creek.

#### KANIKSU NATIONAL FOREST, IDAHO

In 1968 spruce beetles attacked and killed approximately 120 MBM of spruce on about 210 acres in scattered areas of the Priest Lake Ranger District. Infested trees occur in scattered groups ranging from 1 to 11 trees per acre in Willow Creek, North Boulder Creek, the South Fork of Granite Creek drainage, and on Hughes Ridge. Average d.b.h. of infested trees is 21 inches. The Forest plans to include these infested trees in a 778 MBM sale program for 1970.

CLEARWATER AND NEZPERCE FORESTS, IDAHO

Scattered small groups and single trees killed by spruce beetles have been observed in areas of mature and overmature spruce remaining since the outbreak in the 1950's. Most of these areas are small and beetle caused losses are expected to be low next year.



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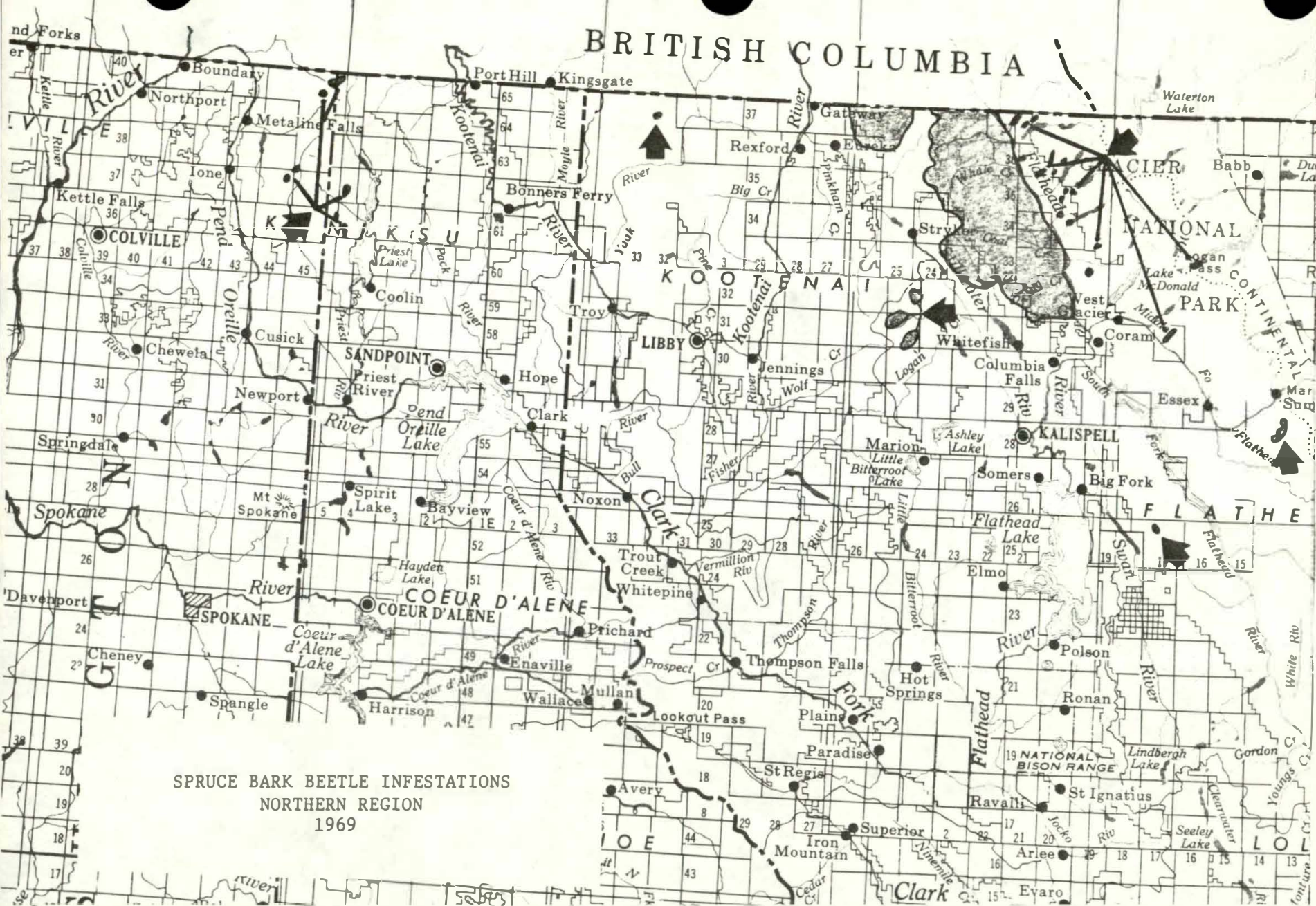
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## BRITISH COLUMBIA



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